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Comment

Interactive comment on “Influence of a component of solar irradiance on radon signals at 1 km depth, Gran Sasso, Italy” by G. Steinitz et al.

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This manuscript is not new to me, as I already reviewed it for another scientific journal. Unfortunately, my comment now does not differ much from that given at that time, as the authors have not changed their basic interpretation on the data they have presented.

General Comments

The paper is interesting because it explores a relatively new aspect of the study of radon signals. The site chosen is undoubtedly suitable for monitoring radon emission avoiding many of the environmental influences that usually affect geogas emissions and soil radon in particular. The data shown have been carefully acquired and the techniques used are sound and well known. Data have been analyzed using appro-

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ropriate statistical procedures and the analytical results are convincing in terms of their overall quality. As already pointed out in my review on the previous version of this paper, what is (still) missing in this work is a careful and thoughtful interpretation of the results. Most of the data analysis shown is devoted only to trying to demonstrate that atmospheric parameters, mostly air pressure, have no effect on radon emissions. This assertion is based on a low correlation between radon levels and barometric pressure data and absence of a 24-hour periodic component in the FFT spectrum of the pressure signal, which is, instead, present in the FFT spectrum of the radon signal. In my opinion, some of the plots suggest, on the contrary, that there is at least a partial influence from barometric pressure on the radon signal, even at the great depth where the monitoring site is located. An inverse correlation between the two parameters is well visible in the plots of Figs. 3 and 8. The low value of the Pearson correlation coefficient in Fig. 9a may be simply due to the non-linear effect of barometric pressure changes on radon signal. Absence of the S1 barometric tide in its FFT spectrum of Fig. 10b seems strange, so I would suggest the authors show a FFT spectrum for the same temporal windows as those used in Figs. 3 (days from about 190 to about 235) and 8 (days from 900 to 950), where a correlation between barometric pressure and radon signal is more evident. The presence of a 12-hour periodic component both in the FFT spectrum of barometric pressure and in that of radon signal (Fig. 10) is compatible with the S2 barometric tide. A similar indication may arise from the results shown in Figs. 13 through 16 (12-hour cycles are observed there). This would be enough to say that an effect of barometric pressure on radon level cannot be ruled out. After all, in Fig. 8 and in the text (line 2 of page 1519) it is clearly stated that sub-surface air pressure follows the above surface air pressure and that the air ventilation system affects air pressure (why not radon emission?). The only factor that the authors present to explain the observed variations in radon emissions, that is solar irradiance, is not totally convincing. A physical mechanism to explain how neutrinos or other radiation can influence radon emission is not clearly given. As this experiment was supposedly prepared to study mostly the effect of solar irradiance on radon emis-

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sions, I am surprised that the authors did not provide independent data on neutrinos detection (the LNGS facility was built also for easy neutrinos detection, as seen in: <http://cfa.lngs.infn.it/research/neutrino-physics.html>).

Specific Comments

All plots for FFT spectral analysis should be carried out for the complete data set, that means for all parameters available and for the whole duration of the experiment, not just for short (and different) periods.

Figures 12 to 16 are probably redundant and could be merged into only one figure.

In conclusion, this paper deserves publication, but only after major revision and a better analysis of all data, before giving conclusive explanations to the observed radon signal variations. The influence of atmospheric parameters must be better assessed, and the role of solar irradiance strengthened.

Interactive comment on Solid Earth Discuss., 4, 1511, 2012.

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